

## Surveying Satisfaction among Tehran Citizens Towards BRT Transport System

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**Abstract:** BRT system is a bus rapid transit which has been adopted with metro system development by municipality in the form of public transportation in Tehran metropolitan to facilitate public transport and tackle the problem of traffic jams and air pollution. The present study studies the equipment, transport system standards and BRT based on library and field research to survey citizens' satisfaction in using BRT lines on Chamran freeway. This study uses descriptive-survey method. In this study, standard SERVQUAL questionnaire is used to assess satisfaction of BRT lines users. In order to test the hypothesis, one sample t test is used.

**Key words:** BRT lines, citizens satisfaction, physical dimension, the reliability dimension, the responsibility dimension, assurance and guarantee dimensions, empathy dimension

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### INTRODUCTION

The 21st century is interpreted as the century of earth urbanization. In this century, cities continue to face serious problems and challenges; some of which related to prior periods and some parts related to recent years. According to statistics provided by the United Nations, it is estimated that the urban population will double by 2025 and reaches to about 5 billion in 1900, only 10% of the world population lived in cities but in 2007 the urban population reached to 50%. It is estimated that this figure will reach 75% by 2050. Thus, >7 billion people will live in cities (Oliver, 2008). In Iran, the proportion of urban population is 68%. However, if the increase in urban population means more problems in the cities with an increase in service requests, institutions and urban management authorities responsible for solving the problems and meeting needs cope with problems and challenges. One of the issues and basic needs in terms of human settlements, particularly in urban area is the issue of access and traffic which can be seen as traffic issues and urban transport; the issues and challenges that are the main concerns of the people and municipal officials. One of the solutions that has been presented in recent years to solve problems and meet the needs of public transport is implementation of BRT transit system by city managers in Tehran which is known as one of a variety of public transportation systems worldwide. Much research has been done on evaluating the efficiency of public

transport. On the other hand, we may conclude by reviewing previous studies that most of them only assessed the performance and execution of different public transportation systems and less surveys on citizens' satisfaction on public transport system has been done. On the other hand, due to existing research gaps in assessing citizens' satisfaction of BRT lines Tehran Municipality considers the research topic as necessary and important. With respect to the evaluation of projects and programs that are done in the public domain, this study examines citizens' satisfaction on BRT lines at Chamran freeway.

**Literature review:** In a study titled "Evaluation of BRT Economic Impacts on Tabriz Commercial Uses, from University Square to Shariati Crossroads", Ghanbari *et al.* (2013) evaluated the effects of BRT system on Tabriz commercial uses from university square to shariati crossroads. The research used documents and field study technique. The data was collected through questionnaires and interviews with shop keepers and merchants and ACCESS and SPSS Software were used to analyze and process information taken. And finally, by entering the data into the GIS, spatial data diagrams were formed through geo-statistical module and output maps have been prepared for easy visual analysis. Based on the results obtained from this study, apart from market downturns and economic difficulties, adverse effects of BRT lines on commercial uses, especially the price of

goodwill and rents and the number of visitors to the shops and stores are dramatically visible. However, the adverse effects on the commercial uses of south is more concrete than northern part. In a research based on library and field study, Pour and Omranzadeh (2012) assessed the performance of BRT transport system in Tehran metropolitan and strategies and discussed its development using SWOT technique. As a result, capacities and limitations was found on BRT system and ultimately, scientific solutions and development strategies were presented. A total of 97 affecting factors on Tehran's BRT Line 1 system were detected. In a study titled "The Bus Rapid Transit Performance", Currie (2005) studied indicators by interviewing bus transportation managers to evaluate the performance of the Mexican bus rapid transit lines. Results show that three factors of cost, air pollution and citizen satisfaction increase are the most important indicators of deciding to review the performance of rapid transit bus development. The results shows that the development of bus transport system will lead to reduced costs and air pollution and increased satisfaction. In a study, Hartmut evaluated the capabilities of rapid bus system (BRT) in promoting transportation-oriented development and carried out analysis on transportation-oriented development of bus rapid transit in Ottawa, Brisbane and Pittsburgh. In this study, the average travel time and average cost of citizens before and after the development of BRT lines was examined to assess the capabilities of rapid bus system (BRT). The results showed a modest reduction in travel time and cost after the development of BRT lines. In a study titled "Bus Rapid Transit: Its Impact on Travel Behavior in Bogota" Camilo Evaluated the Citizens' Satisfaction Toward BRT. The study used a questionnaire, the results showed that citizens' satisfaction on BRT. Henrik (2010) examined the infrastructure of effective and sustainable bus rapid transit planning. Analysis has shown that the BRT is required to have transportation infrastructure which requires review appropriate policies to address limitations and strengthen the existing advantages.

**Variables and research model:** Literature review on customer's satisfaction includes several models which are provided by many researchers around the world. One of these models is SERVQUAL; in which a SERVQUAL questionnaire containing 22 standard questions was used in this study to measure in using BRT lines. In this model, customers' satisfaction will be examined in five physical, reliability, responsiveness and assurance and empathy dimensions (Fig. 1 and Table 1).

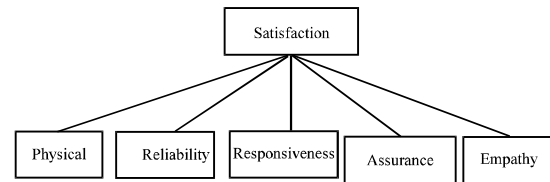


Fig. 1: Conceptual model

Table 1: SERVQUAL scale and its components

Dimensions	Indicators
Physical	Facilities are updated and new Physical facilities are attractive Staff are neat and clean The environment is clean
Reliability	When they commit then they undertake it Show interest to solve customer problems At the due time, correctly perform the service At the promised time, they offer the service Records are accurately maintained
Responsiveness	Customers are informed when service will be done Services are provided fast The staff are always eager to assist customers They are not so busy that they cannot respond to customer requests
Assurance	Employees can be trusted Customers feel comfortable when interacting with staff Staff are polite and humble Staff know the necessary knowledge to answer questions
Empathy	Particular attention is given to each person Hours is appropriate for customers Special attention is given to the health and safety of customers by the
organization	Organization is really and truly interested in customer comfort Organization understand the customer's
specific needs	

## MATERIALS AND METHODS

The study is based on library and field studies. Documents of the research literature are collected from library magazines and Internet resources and contents were analyzed and explained. In addition, since there was no possibility of interviewing all BRT lines users and on the other hand, since information is quantitative and measurable in the questionnaire method and statistical hypotheses using data collected is examined easily, thus, a standard SERVQUAL questionnaire is used (Table 2).

Likert scale is used in questionnaire. Answers are not limited in Yes and No but its intensity is measured. On this scale, answers are divided into 5 groups. From strongly disagree to strongly agree. And a value of 1-5 is assigned to these groups.

**Population and sample:** The population is all Chamran highway BRT passengers. In this study, after pilot

Table 2: Likert scale used in questionnaire

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	2	3	4	5

distribution of 30 questionnaires and collecting and performing the necessary modifications and amendments, separate questionnaires were prepared for the study. To determine the number of questionnaires, the error level of 0.05 and 0.09 accuracy were considered carefully. And according to the above formula, 210 questionnaires were distributed. The sample consists of at least 210 passengers travelling on the BRT and their views were collected through a questionnaire. Samples were selected randomly from both the ladies and gentlemen seating areas on the bus and from the beginning to the end of the route, to broaden the range of different classes of the population.

## RESULTS

**Demographic variables:** According to demographic statistics, it is indicated that the sample had the highest percentage of male gender (90.61%) and the women (10.38%), the highest percentage for the age is between 31 and 40 (57.28%) and the lowest age is over 60 years old (14.7%) and the highest education level is for BC (76.34%) and the lowest percentage of education level is for MS (10.8%).

The confidence factor is calculated using Cronbach's alpha. Table 3 shows the results of Cronbach's alpha using SPSS Software.

The acceptable alpha is higher than 7.0. Since obtained alphas are above 0.70, it can be concluded that the questionnaire is valid. This indicates that the questions are overlapped and are aligned and respondents answered the questions carefully and have paid high attention.

**Descriptive analysis of data:** Table 4 shows the distribution frequency of physical, reliability, responsiveness, assurance, empathy and satisfaction dimensions in a descriptive form in terms of upper limit, lower limit, variance and average responses.

As it is clear from Table 4, the highest average is for the physical dimension (average = 4.25) and the lowest average for the assurance (average = 2.41). The average satisfaction of BRT lines passengers is above the average (average = 3.23).

**Analytical analysis of data:** Hypothesis testing is an important part of data analysis. At this stage of the study,

Table 3: Reliability evaluation

Dimensions	Cronbach's alpha
Physical	0.824
Reliability	0.841
Responsiveness	0.892
Assurance	0.854
Empathy	0.835
Satisfaction	0.885

Table 4: Descriptive assessment of variables

Dimensions	Upper limit	Lower limit	Variance	Average
Physical	5.0	25.3	0.41	25.4
Reliability	4.0	8.2	0.38	37.3
Responsiveness	5.3	5.2	0.25	96.2
Assurance	3.0	2.0	0.31	41.2
Empathy	8.3	8.2	0.30	17.3
Satisfaction	86.3	8.2	0.27	23.3

researchers use statistical tests to test their own hypotheses and prove their accuracy. In the present study, one-sample t-tests were used to test the hypothesis.

### First sub-hypothesis:

- $H_0$ : physical satisfaction towards BRT transport system is not desirable among citizens
- $H_1$ : physical satisfaction towards BRT transport system is desirable among citizens

To evaluate the hypothesis, one-sample t-test was used. The results of this test are shown in Table 5. As Table 5 shows physical dimension average is 4.24 which is higher than the value of test (3). Since, the calculated t (44.58) is higher than table's t (1.671). As a result the hypothesis is in the acceptable area. In this regard with the 95% confidence level we can say that the first hypothesis is accepted. The physical satisfaction of BRT transportation system is desirable among citizens. By studying the variables of the first hypothesis, given that calculated t of all variables is higher than the table's t (1.671) it is concluded that citizens' satisfaction is desirable in each variables of physical dimension in BRT transportation system.

### Second sub-hypothesis:

- $H_0$ : reliability satisfaction towards BRT transport system is not desirable among citizens
- $H_1$ : reliability satisfaction towards BRT transport system is desirable among citizens

To evaluate the hypothesis, one-sample t-test was used. The results of this test are shown in Table 6. As the above Table 7 shows, reliability dimension average is 3.36 which is higher than the value of test (3). Since the calculated t (4.59), is higher than table's t (1.671). As a result the hypothesis is in the acceptable area. In this

Table 5: Results of t-test for the first hypothesis and its variables

Questions (variables)	Number	Average	Standard deviation	Test value	Calculated	df	t in 0.05x = 0.0
1	210	3.4	64.0	3	39.29	209	671.1
2	210	2.4	75.0	3	25.23	209	671.1
3	210	12.4	74.0	3	99.21	209	671.1
4	210	34.4	47.0	3	91.40	209	671.1
Physical	210	24.4	40.0	3	58.44	209	671.1

Table 6: Results of t-test for the second hypothesis and its variables

Questions (variables)	Number	Average	Standard deviation	Test value	Calculated	df	t in 0.05x = 0.0
5	210	3.4	78.0	3	87.23	209	671.1
6	210	4.2	49.0	3	53.17	209	671.1
7	210	4.3	49.0	3	92.11	209	671.1
8	210	4.3	49.0	3	04.12	209	671.1
9	210	31.3	46.0	3	78.90	209	671.1
Reliability	210	36.3	37.0	3	59.40	209	671.1

Table 7: Results of t-test for the third hypothesis and its variables

Questions (variables)	Number	Average	Standard deviation	Test value	Calculated	df	t in 0.05x = 0.0
10	210	5.3	50.0	3	73.14	209	671.1
11	210	5.3	50.0	3	59.14	209	671.1
12	210	4.2	49.0	3	35.17	209	671.1
13	210	4.2	49.0	3	53.17	209	671.1
Responsibility	210	95.2	24.0	3	49.20	209	671.1

Table 8: Results of t-test for the fourth hypothesis and its variables

Questions (variables)	Number	Average	Standard deviation	Test value	Calculated	df	t in 0.05x = 0.0
14	210	40.2	49.0	3	35.17	209	671.1
15	210	31.2	46.0	3	35.21	209	671.1
16	210	40.2	49.0	3	35.17	209	671.1
17	210	50.2	50.0	3	32.14	209	671.1
Assurance	210	40.2	30.0	3	90.27	209	671.1

regard with the 95% confidence level we can say that the second hypothesis is accepted. The physical satisfaction of BRT transportation system is desirable among citizens. By studying the variables of the second hypothesis, given that calculated t of fifth, sixth, seventh, eighth and ninth variables is higher than the table's t (1.671), it is concluded that citizens satisfaction is desirable in each mentioned variables. However, since the calculated t for the sixth variable (-17.53) is lower than the table's t (1.671), it can be concluded that citizens satisfaction is not desirable in the sixth variable.

### Third sub-hypothesis:

- $H_0$ : responsibility satisfaction towards BRT transport system is not desirable among citizens
- $H_1$ : responsibility satisfaction towards BRT transport system is desirable among citizens

To evaluate the hypothesis, one-sample t-test was used. The results of this test are shown in Table 7. As the above table shows, responsibility dimension average is 2.95 which is lower than the value of test (3). Since, the calculated t (-2.49) is lower than table's t (1.671) as a result the hypothesis is not in the acceptable area. In this regard, we can say that the third hypothesis is rejected. Thus, physical satisfaction of BRT transportation system

is not desirable among citizens. By studying the variables of the third hypothesis, given that calculated t of tenth and eleventh variables is higher than the table's t (1.671), it is concluded that citizens satisfaction is desirable in each mentioned variables. However, since the calculated t for the twelfth and thirteenth variables are lower than the table's t (1.671), it can be concluded that citizens' satisfaction is not desirable in these variables.

### Fourth sub-hypothesis:

- $H_0$ : assurance satisfaction toward BRT transport system is not desirable among citizens
- $H_1$ : assurance satisfaction toward BRT transport system is desirable among citizens

To evaluate the hypothesis, one-sample t-test was used. The results of this test are shown in Table 8. As Table 8 shows, assurance dimension average is 2.40 which is lower than the value of test (3). Since, the calculated t (-27.90) is higher than table's t (1.671). As a result the hypothesis is not in the acceptable area. In this regard with the 95% confidence level we can say that the first hypothesis is rejected. The assurance satisfaction of BRT transportation system is not desirable among citizens. By studying the variables of the first hypothesis,

Table 9: Results of t-test for the fifth hypothesis and its variables

Questions (variables)	Number	Average	Standard deviation	Test value	Calculated	df	t in 0.05 $\alpha$ = 0.0
18	210	4.2	49.0	3	35.17	209	671.1
19	210	3.4	78.0	3	87.23	209	671.1
20	210	4.2	49.0	3	53.17	209	671.1
21	210	3.4	64.0	3	39.29	209	671.1
22	210	4.2	49.0	3	35.17	209	671.1
Empathy	210	16.3	29.0	3	8.00	209	671.1

Table 10: Results of t-test for the main hypothesis

Questions (variables)	Number	Average	Standard deviation	Test value	Calculated	df	t in 0.05 $\alpha$ = 0.0
Satisfaction	210	22.3	27.0	3	22.12	9.2	671.1

given that calculated t of all variables is lower than the table's t (1.671) it is concluded that citizens' satisfaction is not desirable in all variables of the fourth hypothesis.

#### Fifth sub-hypothesis:

- $H_0$ : empathy satisfaction toward BRT transport system is not desirable among citizens
- $H_1$ : empathy satisfaction toward BRT transport system is desirable among citizens

To evaluate the hypothesis, one-sample t-test was used. The results of this test are shown in Table 9. As Table 9 shows, empathy dimension average is 3.16 which is lower than the value of test (3). Since, the calculated t (-2.49), is lower than table's t (1.671) as a result the hypothesis is in the acceptable area. In this regard, we can say that the third hypothesis is accepted. Thus, physical satisfaction of BRT transportation system is desirable among citizens. By studying the variables of the third hypothesis, given that calculated t of nineteenth and twenty first variables is higher than the table's t (1.671), it is concluded that citizens satisfaction is desirable in each mentioned variables. However, since the calculated t for the eighteenth and twentieth and twenty second variables are lower than the table's t (1.671) it can be concluded that citizens' satisfaction is not desirable in these variables.

#### Main hypothesis:

- $H_0$ : satisfaction toward BRT transport system is not desirable among citizens
- $H_1$ : satisfaction toward BRT transport system is desirable among citizens

To evaluate the hypothesis, one-sample t-test was used. The results of this test are shown in Table 10. As Table 10 shows, satisfaction average is 3.22 which is higher than the value of test (3). Since, the calculated t (12.22), is higher than table's t (1.671). As a result the hypothesis is in the acceptable area. In this regard with the 95% confidence level we can say that the hypothesis is accepted. Citizens' satisfaction of BRT transportation system is desirable.

## DISCUSSION

Comparing this study with Ghanbari *et al.* (2013) research, it is determined that BRT lines lead to satisfaction of passengers. But from the perspective of store owners in BRT routes, it led to dissatisfaction because they have an adverse effect on sales. This study is similar to Pour and Omranzadeh (2012) research on the introduction of the factors affecting the performance of BRT lines from the perspective of the passengers. Comparing this study with Ziari *et al.* (2011), it is determined that as BRT lines are new and small facilities are available in Tabriz, it can be concluded that the facilities in Tehran BRT lines are better than in Tabriz so it is more successful. The present study is similar to those of Karbasi *et al.* (2011) since all proved useful role of BRT lines in citizens' satisfaction. The present study is similar to Hartmut on the role of BRT lines performance in reducing the average time and cost citizens travel.

## CONCLUSION

The results show that the satisfaction among citizens towards BRT transport system is desirable which in turn reflects the success of this project in Tehran. According to sub-hypotheses of the survey, it is indicated that the state of physical satisfaction, reliability, responsiveness, assurance and empathy of the citizens toward BRT transport system are desirable.

## SUGGESTIONS

Each research aims to use the results to improve or change in a situation. The results of this study could also be used for transport managers whom seeks to establish appropriate transportation systems in the country. In this study, following suggestions are offered based on the results of research to enhance citizens' satisfaction of BRT lines:

- Considering training courses for employees and bus drivers in BRT lines and considering the reward and motivation system to increase responsiveness, politeness and willingness in providing services to passengers
- Considering special facilities for the elderly and disabled in the BRT system toward safety and health of citizen
- Municipality take action by considering a center for BRT lines and promoting it for public to understand the problems and complaints from the public
- Culture development in society and express the results of BRT lines and citizens' satisfaction to increase people's willingness to use public transport, especially in BRT lines
- Since, some discontent is caused by the facilities and the number of buses, it is suggested facilities of BRT lines be increased

### **RECOMMENDATIONS**

Based on the results obtained and mentioned proposals above with respect to the measures taken in this research and the limitations in this study are commendations are presented for future research:

- One of the recommendations for future work is that the researchers study the topic from different perspectives and with different factors in different BRT lines to increase the reliability and generalization of the model
- Research on the role of BRT lines in reducing air pollution

- Research on the role of culture in citizens' use of BRT lines
- Research to identify obstacles and constraints in BRT lines development
- Research on how to select suitable sites for the establishment of BRT lines in terms of performance and increasing citizens' satisfaction
- Research on the role of information technology in better BRT lines management

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